

THE ZOO GOER

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THE ZOOGOER

THE ZOOGOER is a new bi-monthly publication
of the Friends of the National Zoo and replaces
the quarterly publication, *Spots and Stripes*. With
THE ZOOGOER, the Friends hopes to provide
for its membership an up-to-date report on new
animals and exhibits at the National Zoological
Park and in-depth articles on the natural history
and behavior of animals at the Zoo. All of the text
and photographs will be keyed to the centerfold
map in hopes of making a trip to the Zoo a more
interesting, educational, and enjoyable adventure.
THE ZOOGOER will also be on sale at the Friends'
Window Shop and kiosk as a current guide to
points of interest at the Zoo.

Cover: Ling-Ling, the female of the two giant
pandas at the National Zoo.

Friends of the National ZOO

is a non-profit organization of individuals and families who regularly visit the National Zoological Park in Washington, D.C.

Membership in the FRIENDS allows you many benefits that will make your zoo-going more enjoyable and educational.

The membership of the FRIENDS supports and provides volunteer services to the public and the Zoo through such activities as Tour Guiding for public school classes, free information booths on the Zoo grounds, maternity watches for pregnant Zoo animals and Financial support for wildlife conservation and scientific research from the profits of its Window Shop, Kiosk, Balloon Booths and Trackless Train operations.

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an opportunity to be a volunteer Tour Guide leading students through the Zoo; to be a preg-watcher monitoring Zoo animals that are about to give birth; to assist the Friends at their Window Shop or in their office with mailings, typing, etc.

Giant Pandas at the National Zoo



As everybody knows by now, Hsing-Hsing (pronounced "Shing-Shing") and Ling-Ling, the giant pandas presented to the people of the United States by the people of the People's Republic of China, have arrived at the National Zoological Park. Both are adjusting well to their new home (*number 8 on map*), which was prepared for their arrival virtually overnight and is still being worked on as the pandas occupy it. Ling-Ling, the female, threw something of a tantrum on her third day at the Zoo, before the pair were put on exhibit; when she slipped and fell off the pile of oak logs given each panda to climb and play on, she decided to retaliate against her new surroundings. She proceeded to tear up the place, smashing the potted bamboo plants that had been set up around her enclosure. But the next day, when the pair were officially presented by members of the Peking Revolutionary Committee and accepted on behalf of our people by the First Lady, Ling-Ling was on her best behavior and aroused a good deal of amusement by consuming her meal of special panda porridge with obvious if untidy relish, licking the dish clean inside and out, and placing the empty dish on her head.

At present each panda has 1,250 square feet of indoor cage space and a private sleeping den 150 square feet in area equipped with a sleeping platform raised a few inches from the floor. When remodeling is completed, each panda's indoor area will be doubled; and the former white rhino enclosure, currently displaying the crates in which the pair were brought from China, will be converted for use by the pandas. Temporary outdoor yards have also been completed; eventually each of these will cover half an acre and will be planted with various types of bamboo, tufted grasses, and shade trees. The temperature in the glass-fronted Panda House enclosures is kept at about 50 degrees Fahrenheit, reproducing the cool climate of the high altitudes — 10,000 to 15,000 feet — to which the giant panda is native, where snow is on the ground until June and the thermometer rarely registers any higher than this temperature even in midsummer. The pandas are able to retreat to their cooler indoor quarters whenever their outdoor yards become too hot for them. In cooler weather they will doubtless spend more



Hsing-Hsing is smaller and shyer than his mate-to-be and probably about six months younger.

time in their outdoor enclosures and should enjoy being outdoors even on the coldest days; other zoo pandas have been photographed playing or relaxing in the snow.

Both pandas are fed at 10:00 a.m. and 4:00 p.m. besides having constant access to potted bamboo in their indoor enclosures and the bamboo plants growing in their outdoor yards. The morning feeding consists of a specially prepared panda porridge or gruel consisting of rice, reconstituted powdered milk, vitamin supplements, sugar, and a dash of salt. In the afternoon they are given the same mixture, along with fruits and vegetables — including carrots, apples, and kale — and freshly cut bamboo stalks. In addition, bone meal is included in the gruel at the morning feeding and calcium in the afternoon.

It is at and around their feeding times that the pandas are most active. In the wild this

species is reported to be crepuscular in its habits; in other words, rather than being strictly nocturnal or strictly diurnal, giant pandas are active around dawn and dusk and sleep during the middle of the day and the middle of the night. The Zoo's pandas, too, usually sleep during the middle of the day. Before the morning feeding each panda usually emerges from its den for the first time. The male, Hsing-Hsing, makes the rounds of his enclosure at this time, marking his territory by means of urine and the scent-glands each giant panda has located under its tail; he does this for reasons analogous to those for which a domestic dog marks his path when emerging for a walk. He deposits scent on such stationary objects as the pile of logs in the center of the cage and the enclosure walls. After eating, the pandas are still more active and often playful, particularly the female. They were given red-white-and-blue basketballs to play with and seemed to enjoy batting and pursuing the balls much as a housecat would, until both of them managed to puncture them with their powerful teeth.

Bamboo is eaten in the panda's remarkably human-looking manner, held up to the mouth by means of the specially adapted forepaws. The paws can grasp like hands because of the so-called "sixth claw," which is actually an elongated wristbone covered with a pad of

tough, hairless flesh. This structure aids in grasping somewhat as a human thumb does. The palm of the hand is opposable to it, and the bamboo stem is held in a furrow that appears between it and the hairless palm pad when the hand is flexed. One author compares the giant panda's method of grasping to that of a human being wearing a "thumbless mitten," but he adds that the panda is capable of a good deal more dexterity than the comparison might suggest. Indeed, Hsing-Hsing and Ling-Ling are able to pick up small pieces of food with the forepaws and to lift their gruel dishes by the edge.

In order to have at least one forepaw free to hold the bamboo, while eating this food the panda stands on three legs, sits in a slouching posture with his hind legs stretched out in front, or lies on its back. The Zoo's pandas seem to prefer the leaves of the bamboo. When the leaves have been stripped off, the panda may bite the stalk in half and apparently suck juice from the break. The panda may likewise use the forepaws to grasp fruit and vegetables or may pick them up with the mouth while standing on all four legs. Hsing-Hsing and Ling-Ling at first stand on all fours when eating their gruel; then, as the dish begins to empty, the panda may sit down and raise it with its forepaws so as to be able to lick out the corners.

The female is the larger of the two pandas;

Ling-Ling on board the Air Force cargo plane that brought the pandas from Peking.



she weighed 136 pounds on her arrival at the National Zoo, while Hsing-Hsing weighed 74 pounds. By now she is believed to weigh over 150 pounds, and the male's weight has increased comparably. Eventually Ling-Ling should reach an adult weight of 275 to 300 pounds, while the male will eventually weigh as much as 325 to 350 pounds. The Peking Zoo officials that accompanied the pandas on their trip to America and gave National Zoo personnel invaluable advice concerning their care, expressed the opinion, often repeated by the press in this country, that both of the pandas were about a year and a half old at the time of their arrival. Both pandas were captured in the native habitat of this species in Szechuan and Kansu provinces in Western China, the female in June, 1971, and the male the following December. Chinese officials attributed the substantial weight and size difference between the two animals not to an age difference but to Hsing-Hsing's more recent date of capture and their belief that he consequently has not yet had time to adjust fully to his captive diet. National Zoo officials, however, are inclined to believe it more likely that Hsing-Hsing was only about a year old on arrival here and was born in the spring of 1971, while they agree with their Chinese colleagues that Ling-Ling was about eighteen months old at that time and was born in the fall of 1970. In support of this theory, they point out that Hsing-Hsing seems to be a smaller animal in the size of his bones and not simply a less well-nourished one, although males of this species are ordinarily larger than females of the same age.

This interpretation fits well with the admittedly scanty evidence available concerning growth rates of giant pandas — for almost all of which, ironically, we are indebted to the Peking Zoo staff, since it is based primarily on the growth charts they kept of the first two pandas to be born and raised there. The panda weighs as little as 4 to 5 ounces at birth, and its bulk increases at a fantastic rate for the first couple of years. According to the Peking figures, at twelve months a panda should weigh about eighty pounds and at eighteen months somewhere between 130 and 150 pounds. Moreover, it is known that the giant panda ordinarily has a breeding season in the spring, resulting in births in

the winter and fall like Ling-Ling's, but that if a female does not become pregnant in the spring breeding season, she has a second breeding season in the fall, the young from which are born in spring as Hsing-Hsing is presumed to have been.

In the matter of determining the pandas' sexes, National Zoo officials bow to Chinese expertise. Externally the sexes are notoriously difficult to tell apart in this species, particularly in young animals, as zoo pandas so often have been. Of the fifteen pandas exhibited in Europe and America prior to Hsing-Hsing and Ling-Ling, a full third have been incorrectly sexed during their lifetime. Since anatomy provides so little certainty, the Chinese have come to rely on behavioral criteria. Perhaps the most significant of these that the National Zoo visitor can observe is Hsing-Hsing's scent-marking of his territory. In Ling-Ling, as has been the case with other captive females, scent marking occurs far less often. When in sexual heat the female is known to mark intensively — in the wild this serves the obvious function of attracting a mate — but Ling-Ling will not come into heat until she is about three years old. The fact that Ling-Ling is in general more playful and extroverted is another sign; though there have been exceptions, young female pandas in the past have proven to be the clowns of the species, playful like Ling-Ling but also equally given to sudden outbursts of temper. Males, on the other hand, are reported to be shyer and more introverted.

Though they were on exhibit simultaneously for several months at the Peking Zoo, Hsing-Hsing and Ling-Ling have never met. In the wild, giant pandas are solitary and adults meet only to mate, thus the National Zoo has provided its pandas with separate enclosures and intends to keep them apart except in mating season when they are of age. Between their temporary outdoor yards, there are open panels through which they can see and smell each other. Their permanent indoor and outdoor enclosures will be separated by walls with barred moongates through which the pandas will also be able to see and smell. They will thus be able to familiarize themselves with each other gradually, so that when they are ready to breed at the age of about three years, they will not be total strangers.

Mammals

Sable Antelope Born



The frisky calf in the foreground is the latest addition to the Zoo's sable antelope herd (*number 3e on map*),

A sable antelope (*Hippotragus niger*) was born in April, and the Zoo now has six of this exceptionally beautiful species. Sharing the same enclosure with the calf and its mother (*number 3e on map*) are two juveniles born here last year, one of them to the same mother, and one young adult female of about two years. The father of the recent offspring is kept in a separate enclosure to the right (*number 3d on map*) except at breeding time.

As in all antelope, the calf was born quickly and was able to stand soon after birth; in this species the calf is usually able to do so within ten minutes. In the wild sable antelope inhabit woodlands and woodland meadows, and the mother takes her newborn calf to a hiding-place in thick cover where it spends its first two or three weeks of life. Meanwhile she continues to travel and feed with the herd, and only visits the calf under cover of darkness to feed it. One interesting adaptation for this method of rearing the young is that during this time the calf is unable to urinate or defecate without the stimulus of licking by the mother. This prevents

odors that might reveal the hiding-place to a predator. The Zoo's mother likewise found a hiding-place between two large logs in the antelope's enclosure where her offspring remained hidden for the first two weeks of its life, and she returned to feed it only once or twice a day. By two weeks the calf began to spend most of its time with the Zoo's small herd; by three weeks it was with the herd all the time.

Observers of this species in the wild have often reported that the bond between mother and young seems looser than in many other members of the *Bovidae*, the family that includes not only antelope but also sheep, goats, and cattle. Except when nursing, the young associate not with their mothers but with the other young members of the herd. The calves play together when the herd is resting and, when the herd moves, travel in a group together, usually at the rear of the herd. This is a surprising position for the calves to take, since one would expect them to be most vulnerable to predation there; but perhaps it is indicative of the confidence these formidable antelope have in their ability to defeat any predator by fighting back with their powerful horns. In any event, this year's Zoo-born calf is true to pattern in associating most often with the two yearlings and with the young adult female.

The calf, a female, is pale brown; and the black coloration for which this species is named is present only on the short mane of darker hair along the neck and back. The Zoo's yearlings illustrate the process of gradual color change she will undergo; their fur has become a deep chestnut-brown, with black beginning to appear on the back and forequarters. The process is still more advanced in the young adult female. She is about two years old and is probably sexually mature or very close to sexual maturity, although she will not reach full adult size and horn length until she is two-and-a-half or three years old. The adults' fur, it should be noted, though it looks black in most lights, has chestnut highlights and sometimes appears quite reddish.

The calf's horns first appear as tiny buds at the age of about two months; this is comparatively late for antelope, many of which have noticeable buds at birth and horns

several inches long within a month or two. The yearlings' horns are now about eight inches long and are just beginning to show the backward curve that is so marked in those of the adults of this species. The record length for the sable antelope's horns is nearly 65 inches; this occurred in a rare subspecies known as the giant sable antelope. In other races the maximum is about 52 inches.

Two-toed Sloth Infant at the Lion House

On March 9th, a two-toed sloth (*Choloepus didactylus*) was born at the Lion House (number 23 on map), the first birth in the Zoo's group since 1965. The infant, whose velvety fur is much shorter than an adult's and pale brown in color, is not always easy to see. Clinging to its mother's breast, its claws hooked in her long fur, it is often completely hidden as she hangs upside down from a branch or the wire top of the cage. Those who do catch a glimpse of the young sloth will find it sprawled "right-side-up" across the chest of its upside-down mother, with its head facing toward her head. Not surprisingly, since the infant is so often hidden from view, its sex has not been determined; in fact, it is difficult to tell the sex of two-toed sloths even on close examination.

Although this birth was unobserved, a zoologist present at a previous Lion House birth has described in some detail what took place on that occasion: "The infant emerged head-first, facing upwards. The embryonic membranes were torn easily in the birth process. The mother was in normal adult (upside-down) hanging position and made attempts with the foreleg to pull the infant between the hind legs onto her abdomen. The infant hooked onto the mother with its forelegs as soon as these were free and wriggled extensively to free the rest of its body from the birth canal. Other sloths (number not determined) assisted by preventing the infant from falling and by cleaning the mother and infant by licking."

In spite of this report of cooperation among adults at a birth, the adults, including the mother, show surprising indifference towards

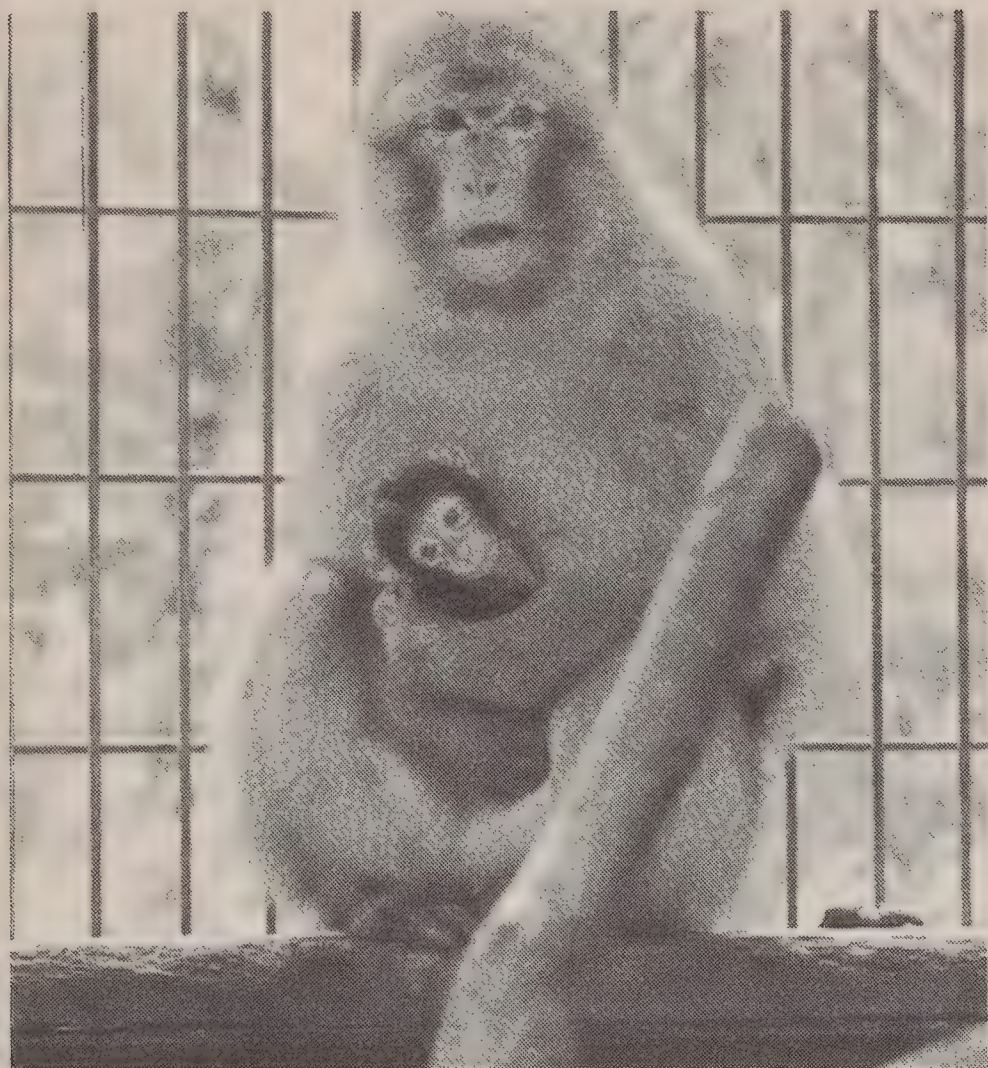
the young sloth during the rest of its infancy. It is up to the youngster itself to hold on tightly to its mother, since she makes no particular effort to ensure that it remains attached to her. When she goes into one of the barrels in which the Zoo's sloths sleep, for instance, she does not assist the infant, and it must manage to clamber in alongside her on its own. The other adult females in the group likewise seem to show no interest; but, like the mother's, theirs is a tolerant indifference. When, as often happens, one or both of the two other females are hanging close to the mother, their heads together and their noses touching, the youngster may sometimes climb — apparently by mistake — onto one of the other females.

She will allow the young sloth to cling there without protest. The young sloth may be apart from its mother for as long as three or four hours but will find her again when it is time to nurse, probably by means of smell; and when the cluster of adults finally separates, the infant will have always have returned to its mother. The father (the darkest brown of the four adults) seems to have no knowledge of his relationship to the infant and pays no attention to it.

The young sloth will continue to cling to its mother until it is approximately two-thirds grown; at the age of about six months it will begin to be semi-independent and will sometimes be found hanging by itself. When and how it learns to assume the normal adult posture is not known. It is equally uncertain exactly when the young sloth begins to eat solid food; but young born at the Lion House have sometimes been seen reaching out to steal a piece of food from the mother as she feeds on the lettuce, kale, oranges, apples, and bananas that are provided for the Zoo's sloths.

In spring and summer the cats are outdoors in the morning, and the Lion House is closed until 1:00 p.m. Since the sloths do not have an outdoor enclosure, they are off exhibit at this time. The sloths can be seen between 1:00 and 2:30 p.m. every day, when the cats are feeding indoors; also, on cooler spring and summer days, the building may remain open between 2:30 and 6:00 p.m.

Barbary Ape Population Increases



A mother Barbary ape clutches her infant (*number 22h on map*). Her open mouth is a common primate social signal, indicating a threat or warning towards another individual coupled with a certain amount of fear on the part of the threatening animal. Often this facial expression, which may be accompanied by sharp “barks”, is directed towards a stranger of the same species approaching the Barbary ape group; in this case it is elicited by the presence of the photographer.

The first Barbary ape (*Macaca sylvanas*) births of the spring took place in the first half of May, when four tiny black-furred infants were born to grayish-brown mothers in two enclosures (*numbers 22g and 22h on map*). Pending more births in what has become an annual population explosion, the Zoo now has 23 of these tail-less monkeys on exhibit in these cages and in two others, also located behind the Lion House (*numbers 22b and 22d on map*). The old quip that there are more Barbary apes at the National Zoological Park than in the famous colony on the Rock of Gibraltar is probably not literally true at this moment; but certainly this species has bred well here over the years, and the National Zoo’s colony has provided Barbary apes for many other zoos.

Not only do the four Barbary ape groups illustrate the remarkable success the Zoo has had with this species, but the observant visitor will find each of them a fascinating society in miniature. In both of the cages

in which young have been born this spring, there are a number of adult females and the young born to them last year. These monkeys interact in a variety of amicable and hostile ways, with conflicts resolved and justice meted out by the authority of a dominant adult male. Once, one of the recent mothers was seen grooming the fur of one of the year-old juveniles while the infant clinged to her breast, and the adult male climbed up and chased the juvenile away. Evidently the juvenile was receiving more attention than was his due. At other times, however, a juvenile has been seen grooming one of the infants with the mother’s apparent approval.

The infants are involved in another interesting behavior pattern. Often an adult male will approach one of the mothers, take hold of the infant’s lower legs, and examine its bottom while it still clings to its mother’s chest fur with its hands. Like similar behavior towards subordinate adults, this is the father’s way of asserting his dominance over both the mother and her offspring.

Puma Cubs

In early May, a pair of puma cubs (*Felis concolor*) were born in the den at the rear of their parents’ cage (*number 22a on map*). Soon afterwards, the father was removed from the enclosure and placed in the Lion House (*number 23 on map*). In this species, as in most members of the cat family, the adults are ordinarily solitary; they meet only to mate and separate soon afterwards. Thus, in the wild the female alone raises the young; and a captive father’s reactions to a newborn litter were thought to be too unpredictable to risk his presence in the same enclosure.

The young have dark brown spots, and their tails are ringed. These markings will gradually disappear, and by the time the cubs are six months old they will have uniform tawny coats like their parents. At that time they will weigh between 30 and 45 pounds. Born blind, they were able to see after two weeks and at that time began to emerge from their den. They will be weaned some time after the fifth week of life, and after that they should appear outside much more frequently, playing energetically and practicing the hunting skills on which these predators depend for their survival in the wild.

New Muntjac Yard

A new enclosure (*number 3c on map*) has been built to house Indian muntjac (*Muntiacus muntjak*). The Zoo has six of these tiny deer, three males and three females. Of the males one is an adult, distinguished by the fact that he grows antlers and by his tusklike elongated upper canines; one was born here in May, 1971; and one is a young fawn, born on April 14, 1972.

The enclosure previously occupied by the muntjac (*number 9d on map*) will now be used for some even smaller hoofed mammals, Kirk's dik-dik (*Madoqua kirkii*), a species of antelope. Adults of this species weigh less than a dozen pounds, as opposed to about 38 pounds in the muntjak. Kirk's dik-dik is also remarkable for its unusual proboscis-like snout. Currently the Zoo has only one of these antelope, a male sharing the red kangaroos' yard (*number 9i on map*); but in July two females are expected to arrive, forming the nucleus of a breeding herd.

Gorilla Birth

After several weeks of the Friends of the Zoo's 'round-the-clock "preg-watch," on May 29 Femelle, the female gorilla, gave birth to a male infant, her first offspring. She is about ten years old and has been at the National Zoo since 1965. The infant was removed for hand rearing at the home of Headkeeper Bernie Gallagher and his wife, Louise, and will be put on exhibit in about six months.

Birds

Satin Bowerbird Building a Courtship Bower

Early in April, the male satin bowerbird (*Ptilonorhynchus violaceus*) at the Bird House (*number 5 on map*) began to build one of the courtship "bowers" for which this species is famous. On the floor of cage 2 (to the right of the front door) the glossy blueish-black male constructed an arch of stiff grasses — or rather two sides of an arch, not quite coming together at the top. Knowing that the satin bowerbird likes to decorate his bower with blue objects, keepers provided hyacinth petals and pieces of blue string, which the male promptly

carried over to his power and strewed about it. As a further means of enhancing the bower, the male satin bowerbird is reported to "paint" its sides sometimes, using a piece of soft bark as a brush and earth, charcoal, or ashes moistened by saliva as paint; but the Zoo's male has not as yet been seen doing so.

When the bower had begun to take shape, the male started to court the pale-green and brown female by walking up and down through the center of his archway with his closed wings lifted slightly, occasionally adding a new piece of grass to the bower, picking up one of the blue petals with his bill, or calling from a nearby branch. Eventually the female began to show signs of responding. By the middle of April, although she would not go near the bower, she frequently perched next to the male when he was perching on a tree a yard or two from the bower. By the end of the month, she was often visibly excited. She would spend long periods flying back and forth the length of the cage, landing gracefully, slowed by her spread wings, and pausing less than a minute at each end. Sometimes she would approach the male, her bill wide open and her throat working. At first he often seemed shy and would sometimes withdraw at her approach; if she flew off, he would seem about to follow her, then stop and fly back down to his bower. But soon, when she flew towards the far end of the cage, he would sometimes follow right after her and land next to her. Meanwhile his courtship display at the bower was becoming more intense, and he began to reveal the exceptional mimetic abilities of this species, which have to be heard to be believed.

The male satin bowerbird is capable of mimicry only during the part of the year when he is engaged in courtship, and experiments have shown that castration inhibits mimicry in this species, while male hormone injections re-establish it. It would take an expert on Australian birdsong to tell what species the Zoo's male is mimicking — if, in fact, he is always reproducing the calls of other actual species. But it is readily evident that he is capable of producing a considerable variety of sounds.

Most common, perhaps, is a soft cawing call, but there are also louder squawks, whistles, a sparrow-like twitter, a somewhat chicken-

like cluck, and a repetitive cricket chirp. Still other sounds recall no other living thing; one can only be described as the sound of an alarm clock being wound up. Occasionally, the bowerbird will produce what seems to be the sound of a whole grove-full of twittering passerine birds; when he does so, the observer finds it almost impossible to believe that such a variety of apparently simultaneous sounds are coming from one bird. This ventriloquial effect may continue for about a minute, when it is terminated by a somewhat louder, but equally distant-sounding scream. Moreover, the bowerbird does not usually produce these different sounds at separate times but runs through almost the entire repertory in quick succession.

The female satin bowerbird is able and willing to breed for a much shorter period than the male. In the wild the female will wait as long as several months in the area of the male's bower while he continues to display and add to his structure in various ways. During this time she will gradually become more and more excited and more and more responsive to his courtship, just as the Zoo's female has been doing. Finally, when the insects on which the wild female's young will be fed become plentiful in the forests of Eastern Australia to which this species is native, the wild female becomes ready to mate and actively solicits the male. Copulation has been observed to take place within the bower. After that, the bower goes to no further use, and the female departs to build her nest and raise her young alone.

In the first weeks of May, the Zoo's female was seen walking into the bower, where she had never ventured before and even pulling at one of its straws with her bill; the male, on the ground nearby, would open one wing and raise it, vibrate his tail for about thirty seconds, then open and raise the other wing, giving a loud whistle. At this time the cage was partially screened off around the bower, so that the birds would not be unduly disturbed; but it is still possible for visitors to see the bower and the male's continuing courtship activities.

As we go to press, we do not know when to expect mating. If the pair do mate successfully, the female should eventually build a cup-shaped nest of thin twigs partly lined

with dry leaves, probably in a fork of one of the trees in the birds' cage. The usual number of eggs for this species is reported to be two, although clutches of one or three are sometimes found. The incubation period is nineteen to twenty-three days.

Two New Toucan Species on Exhibit



The two new keel-billed toucans in cage 11 at the Bird House (*number 5 on map*).

Many new species have been placed on exhibit at the Bird House this spring. Two of these — the keel-billed toucans (*Ramphastos sulfuratus*) in cage 11 and the curl-crested toucanets or curl-crested araçaris (*Pteroglossus beauharniaesii*) on the other side of the building in cage 6 — belong to the remarkable toucan family, members of which are well known for the improbable size of their bills. The keel-billed toucan is typical of the larger species in this family, while the smaller curl crested toucanet not only has a large bill, though actually a relatively moderate-sized one for a toucan, but also has some of the most distinctive head plumage found in any bird.

The curl-crested toucanet's head is covered with black "pin curls" actually curled and greatly broadened feather shafts. What, if any, special functions these highly specialized feathers have is unknown. But the Zoo's curl-crested toucanets have been seen apparently grooming each other's head plumage with their bills, thus involving these mysterious feathers in one behavior pattern with the equally unusual oversized bill.

ZOOMAP

1. Connecticut Avenue pedestrian entrance
2. Connecticut Avenue vehicular entrance
3. Deer and antelope areas (a-j)
4. Great Flight Cage
5. Bird House
6. Pheasant and crane line (a-r)
7. Raptor cages (a-d)
8. Delicate-hoofed stock building (a-c)
9. Hardy-hoofed stock complex (a-i)
10. Panda House (a-c)

11. Elephant House
12. Water birds (a-e)
13. Hawks and owls (a-c)
14. Goat mountain areas (a-e)
15. Small Mammal Building
16. Lesser Pandas
17. Prairie dogs
18. Bears and monkeys (a-m)
19. Reptile House
20. Tortoise yard
21. Monkey House
22. Hardy Animals (a-o)
23. Lion House
24. Komodo Dragon
25. Bears (a-j)
26. Water animals (a-e)



27. Sea Lion pool
28. Wolves, foxes, and wild dogs (a-l)
29. Lesser Cats
30. Waterfowl ponds (a-d)
31. Police Station—Restrooms—First Aid
32. Restaurant
33. Picnic Area
34. Window Shop
35. Rock Creek Parkway entrance
36. Friends of the National Zoo Offices
37. FONZ Education, Editorial, and Tour Guide Offices



Telephone



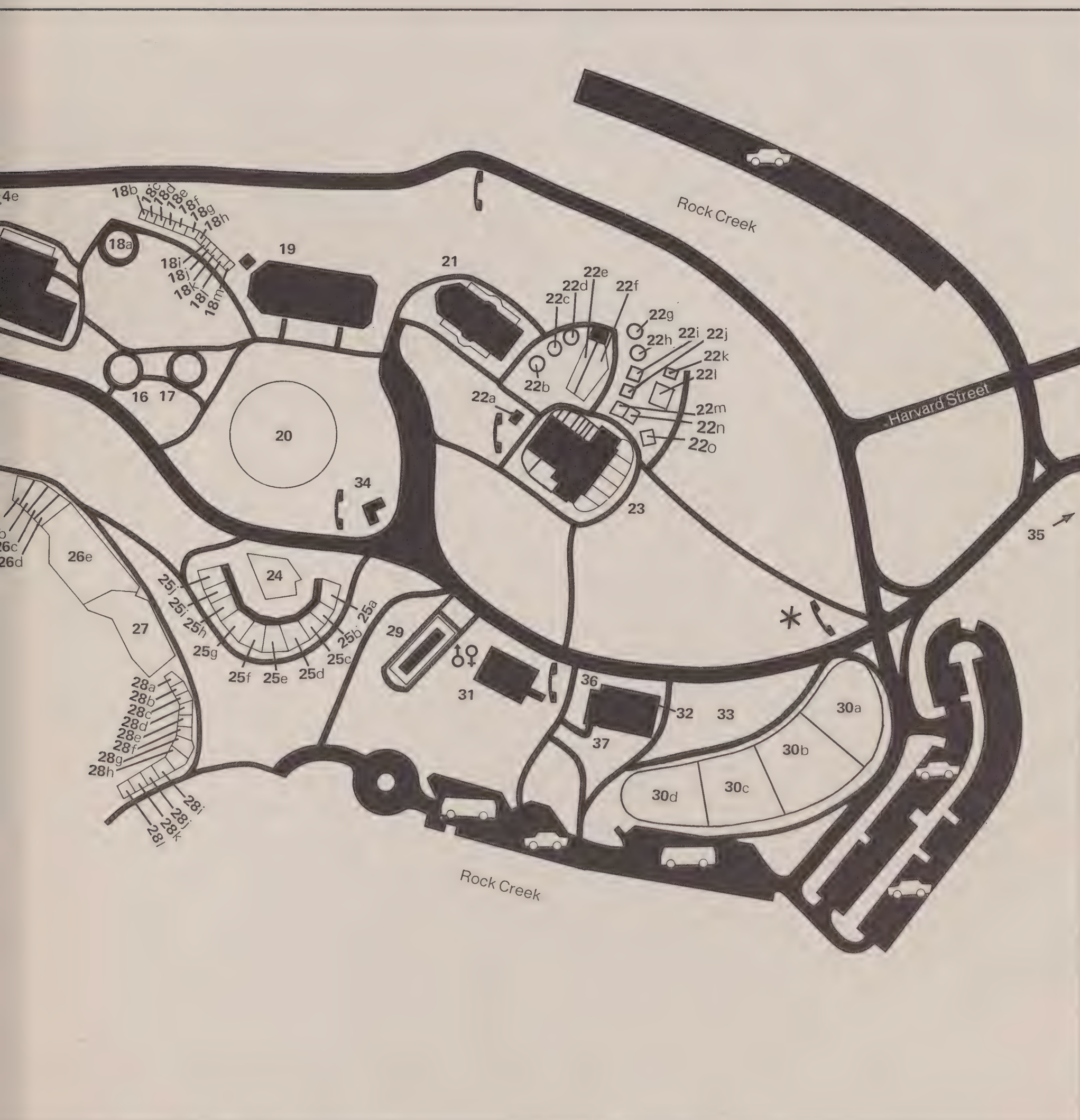
Restrooms



Trackless Train Stops



Parking



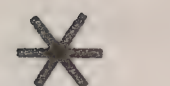




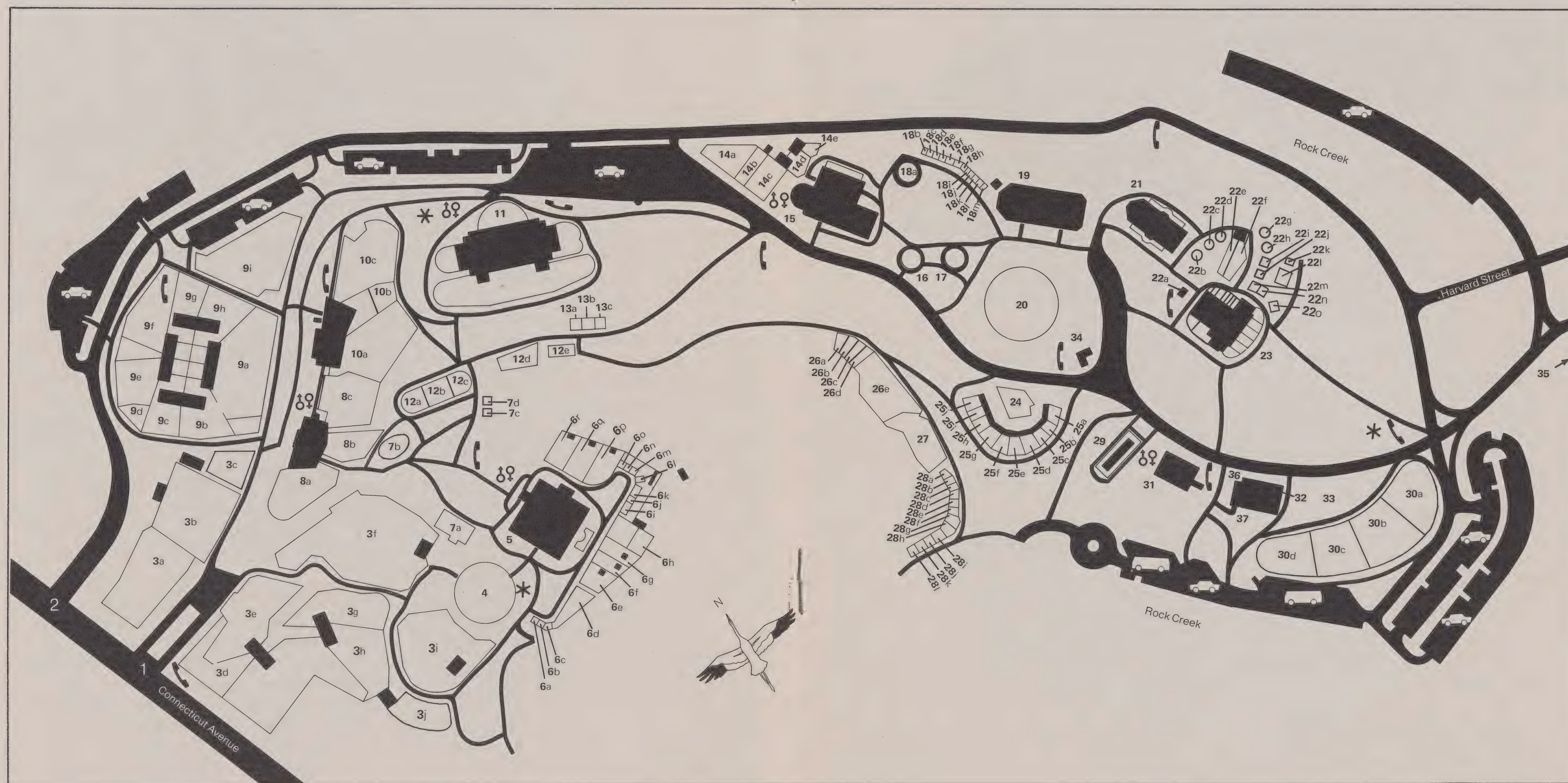
ZOOMAP

1. Connecticut Avenue pedestrian entrance
2. Connecticut Avenue vehicular entrance
3. Deer and antelope areas (a-j)
4. Great Flight Cage
5. Bird House
6. Pheasant and crane line (a-r)
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8. Delicate-hoofed stock building (a-c)
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Toucans are known to use their bills to reach out from branches to obtain fruit and berries; the toucan bites off a berry or a chunk of fruit with the tip of its sharp-edged bill and throws its head back so that the food slides down the bill into the throat. A large piece of fruit is first chewed in the tip of the bill; and the tongue, which is nearly as long as the bill and fringed with bristles on both sides, aids in mashing the pulp. Similarly, in drinking, water is taken in the tip of the bill and flows down into the gullet when the head is reared back.

But many scientists do not believe that these uses totally account for the spectacular form the bill has taken. To some of these its size, along with its brilliant coloration in many species, suggests that it plays a role in courtship display and in helping the toucan recognize members of its own species, just as distinctive plumage is known to do in many other birds. Supporters of this theory point out that many of the species with the most gaily colored bills have black bodies. The keel-billed toucan is one of these; its body is entirely black, except for a deep red rump patch and a yellow throat, but its bill is a gaudy yellow with a green stripe. As yet, however, there seems to be little concrete evidence to support such conjectures. And the curl-crested toucanet further complicates matters by having a comparatively dull-colored bill and comparatively distinctive plumage, with a pale yellow breast divided by a bright orange band.

The size of the toucan's bill necessitates some unusual sleeping arrangements. The neck is twisted backwards, and the head and bill are laid sideways across the back. The tail is then spread like a fan and folded up over the back covering the head and bill. The sleeping toucan has been described as looking like nothing but a ball of feathers. This habit is doubtless associated with the fact that many toucan species are known to spend their nights in communal roosting cavities, where space is at a premium and any method of getting the birds' bills and tails out of the way is a definite advantage.

It is with some excitement that the Bird House officials report that the curl-crested toucanet pair are showing interest in the nest box provided for them in their new home,

since toucans are rarely bred successfully in captivity. Part of the reason for this may lie in the fact that the young are hatched completely blind and featherless and develop extremely slowly for birds. Their eyes do not begin to open until they are three weeks old, at which time the young are still featherless, and in some species of these cavity-nesting birds the nesting period is longer than six weeks. At birth, the lower half of the bill is broader and larger than the upper half, which is an obvious adaptation for receiving food from the parent; and it takes over a month for the bill to assume its adult shape and coloration.

Giant Pittas in the Indoor Flight Room



One of the three new giant pittas in the indoor flight room at the Bird House (*number 5 on map*); this is the smaller of the two males.

Three giant pittas or great blue bittas (*Pitta caerulea*) have been added to the ranks of ground-feeding species in the indoor flight room at the Bird House. These plump, stumpy-tailed birds are usually to be found to the left of the front entrance to the room, hopping along in search of food and sometimes pausing to snap up earthworms in their broad, slightly downcurved bills. Two are males; they are quite conspicuous, with bright turquoise wings and backs and brownish-white undersides. The single female is less noticeable; her back and wings are brown and only her tail feathers show the male's turquoise color. Both sexes, with their long-legged hops and their manner of pausing alertly with the bill raised high in the air, seem invariably to strike human observers as comic.

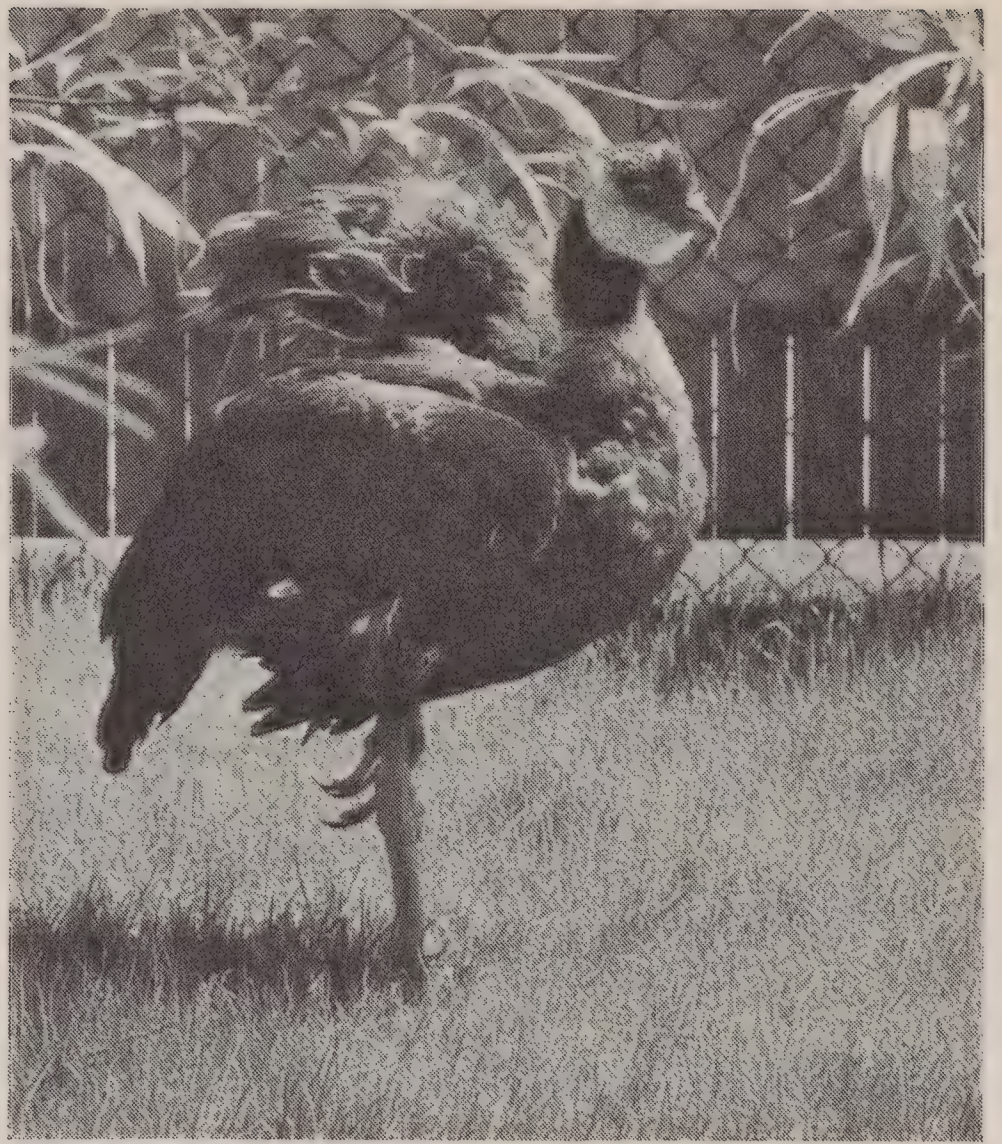
The pittas (family *Pittidae*) — also known as jewel-thrushes because of their bright colors, although they are not true thrushes — are all

characterized by the same stout body and short tail. The hooded pitta (*Pitta sordida*) in cage 5 is another member of this family on exhibit at the Bird House; its small size is more typical of the pittas, and compared with it the giant pitta is truly a giant. All pittas inhabit the Old World tropics, searching damp forest floors for large insects, other invertebrates, and small vertebrates. Although they usually rely on hopping quickly through the underbrush to escape danger and their rounded wings are surprisingly small, pittas are capable of strong flight. Some species migrate for great distances. Others, including the giant pitta, make shorter migrations; this species is reported to alternate winter and summer ranges in its native lowland forests in Malaya, Sumatra, and Borneo.

All of the pittas return to trees to roost at night, and all build their large, globelike nests of twigs, moss, bark, and leaves in trees and bushes. In spring, the male departs from his usually terrestrial daytime habits to spend some time defending a breeding territory from other males by making loud whistling calls from an elevated perch. In some species, he may also advertise his possession of the territory and his readiness to breed by making short, looping flights from such a perch.

The larger of the two giant pitta males in the indoor flight room seems to have assumed a dominant position relative to the smaller male, and the smaller male hops away when the larger one approaches. In addition, the smaller male seems never to be allowed to approach the female closely, while the female and the larger male can sometimes be sighted foraging alongside each other, as pairs of these ordinary solitary birds do during their breeding season in the wild. A few times the larger male has been seen apparently warding off the smaller male with an interesting threat display. The smaller male will be feeding or standing still, and the larger male will approach him from behind. The smaller male will turn his head to look back and freeze in an alerted position. Then the larger male will display towards him by slowly expanding and contracting his round belly. On one occasion the larger male was seen chasing the smaller one; after the latter had scurried off ignominiously, the larger male displayed in the same way and erected some of his blue back feathers.

Black-necked Screamers — Unusual Waterfowl



The black-necked screamer (*number 6d on map*) is an unusual distant relative of ducks, geese, and swans.

Other recent arrivals in the Bird Division include a pair of black-necked screamers (*Chauna chavaria*), located in an outdoor enclosure behind the Bird House (*number 6d on map*). These birds inhabit marshes, wet grasslands, and forest lakes in tropical and subtropical South America, where the harsh cries for which they are named can be heard for as much as two miles. They separate in pairs during the breeding season; but, during the rest of the year, they congregate in large groups, sometimes numbering in the thousands, and the “concert” of sound such a group can produce is said to be truly deafening.

There are three species of screamer, placed by ornithologists in a family of their own (*Anhimidae*), which is included in the same order, the Anseriformes or waterfowl, as ducks, geese, and swans (family *Anatidae*). Unlike those of ducks, geese, or swans, screamers’ feet are only very slightly webbed, and their long toes are adapted for stalking across mats of floating vegetation. Screamers have many other unusual characteristics. Pelicans and some other sea birds have a layer of tiny air bubbles between the skin and the body to increase bouyancy, but in the screamers this sort of flotation system

reaches its greatest development, extending down over the legs as far as the toes. Reportedly these bubbles cause a screamer's skin to crackle audibly when pressed by a finger; and, by distending these air cells, the screamer itself is able to produce a low rumbling sound.

In most birds feathers grow only on certain parts of the skin surface; in screamers — as in the primitive penguins and ostriches — the feathers are distributed almost continuously over the body. But perhaps the most noticeable peculiarity of the screamers is a sharp spur that grows on the forward edge of each wing; present even in newly hatched chicks, these spurs are formidable defensive weapons. As if all of this were not enough, one species of screamer, the horned screamer, has a long, curved “horn” of skin-covered cartilage growing from its forehead, the function of which is unknown.

In the wild screamers are believed to mate for life. Their large, untidy nests are island-like piles of sticks and rushes built in shallow marsh water reaching several feet above the surface. The four to six young, like ducklings and goslings, leave the nest after a few days and follow the mother. The black-necked screamer is said to feed exclusively on vegetable matter in the wild, particularly on grasses and the seeds of water plants.

Three Young Double-wattled Cassowaries Acquired



One of three juvenile double-wattled cassowaries recently acquired by the Bird Division (*number 6h on map*). The “wattles” for which this species is named are the two small fleshy growths visible on this young male's neck; they will eventually become much larger and assume a bright red color. Notice also the long sharp quills on the wings at the lower lefthand corner of the picture; these protect the bird as it travels through thick underbrush.

Three juvenile double-wattled cassowaries (*Casuarius bicarunculatus*) have recently been acquired and are on exhibit behind the Bird House (*number 6h on map*). Previously the Zoo had only one member of this flightless species, an adult male, now located in a holding pen at the rear of the young cassowaries' enclosure. Less than a yard tall at present, the young birds will grow to the same nearly five foot height; meanwhile, their long, drooping feathers, now light brown, will gradually assume the black coloration of the adult's. In one of the three this process has already begun, and the plumage has a marked blackish cast, especially on the back. The wattles for which this species is named — the fleshy growth hanging from the throat — will increase in size as the birds mature and assume the bright red color that in the adult contrasts so vividly with the blue skin around the eyes.

Unlike their closest living relatives, the emus (*number 6f on map*), which inhabit grasslands, and the superficially similar but much more distantly related rheas and ostriches, cassowaries and forest birds and possess several notable adaptations for a life in thick underbrush. One is the hard bony casque on the forehead, which is used to ward off thorny vines and branches; this structure has not yet developed in the Zoo's young birds, but a bony plate is present where it will later grow. Their rudimentary wings carry several long quills, which further protect the body from such obstructions. They are swift runners, and like the emus and rheas, they have only three toes, as opposed to the four toes usual in birds. As in hoofed mammals, the reduced number of toes is an adaptation for speed and a terrestrial existence. The middle toe bears a long spike-like claw which can inflict great damage when the bird is cornered by an adversary.

As in emus, rheas, and ostriches, the male alone incubates the eggs, which are laid in a clearing on the forest floor. He too is charged with feeding the young. Two of the Zoo's new cassowaries are males; the one whose plumage is black on the back is a female. It is hoped that it will eventually be possible to mate her with the older male or with one of the younger ones.

Reptiles and Amphibians

Komodo Dragons Moved to Summer Quarters



The Zoo's male Komodo monitor or Komodo dragon (*number 24 on map*). As in other lizards and snakes the long, flickering tongue functions as an auxiliary to the sense of smell, conveying scents dissolved in the saliva to two pits in the mouth known as Jacobson's organs. This extra sense of smell is valuable since reptiles' breath rate depends on their temperature—which in turn depends on the temperature of their surroundings—and thus sometimes is not able to provide needed information to the ordinary nasal channels of smell.

In early June, the Zoo's Komodo dragons or komodo monitors (*Varanus komodoensis*) were placed in their outdoor summer enclosure (*number 24 on map*); this enclosure has been used for Komodo dragons since 1964, at which time the Zoo had only the female ("Rini") of the current pair. At that time the house in the yard was built and heat coils installed in the floor for the colder nights. When the male ("Kelana") arrived in June, 1970, he was first introduced to the female in this same enclosure.

Both lizards seem to enjoy their summer home, and many interesting aspects of this little-known species' behavior have been observed there. Though they could not by any means be said to frequent the pond provided for them, they do sometimes enter the water; and, when they do so, they prove like the other members of the monitor family to be excellent swimmers. Like the other monitors they swim in a manner reminiscent of that of the crocodilians, propelling themselves by

a side-to-side motion of the tail, with both front and back legs tucked in close to the body.

More often they are likely to use the pool as a source of drinking water, although they seem to prefer to get their water in other ways. Both usually drink soon after eating. The male has often done so from a hose or a keeper's cupped hand. Both dragons will frequently drink from puddles left in the grass after a rainstorm or after their enclosure has been watered by keepers; this preference may reflect the arid conditions in their natural habitat on Komodo, Flores, and other islands in the Lesser Sunda Group east of Java, where water may only be available after rainfall. When they do drink from the pond, the dragons take a large number of successive gulps, after each of which the tongue is extended several inches. The nostrils remain submerged for as many as forty gulps before the lizard pauses for a few seconds to breathe.

The Zoo's Komodo dragons are fed a varied diet, including rabbits; ground horse meat, horse liver, and horse hearts; and the meat and intestines of deer, sheep, and goat. The food is generally given in large pieces weighing approximately two pounds. On several occasions, the female has been seen stalking live prey that has happened into the outdoor enclosure; she has caught and eaten a squirrel, a pigeon, and a number of mallards.

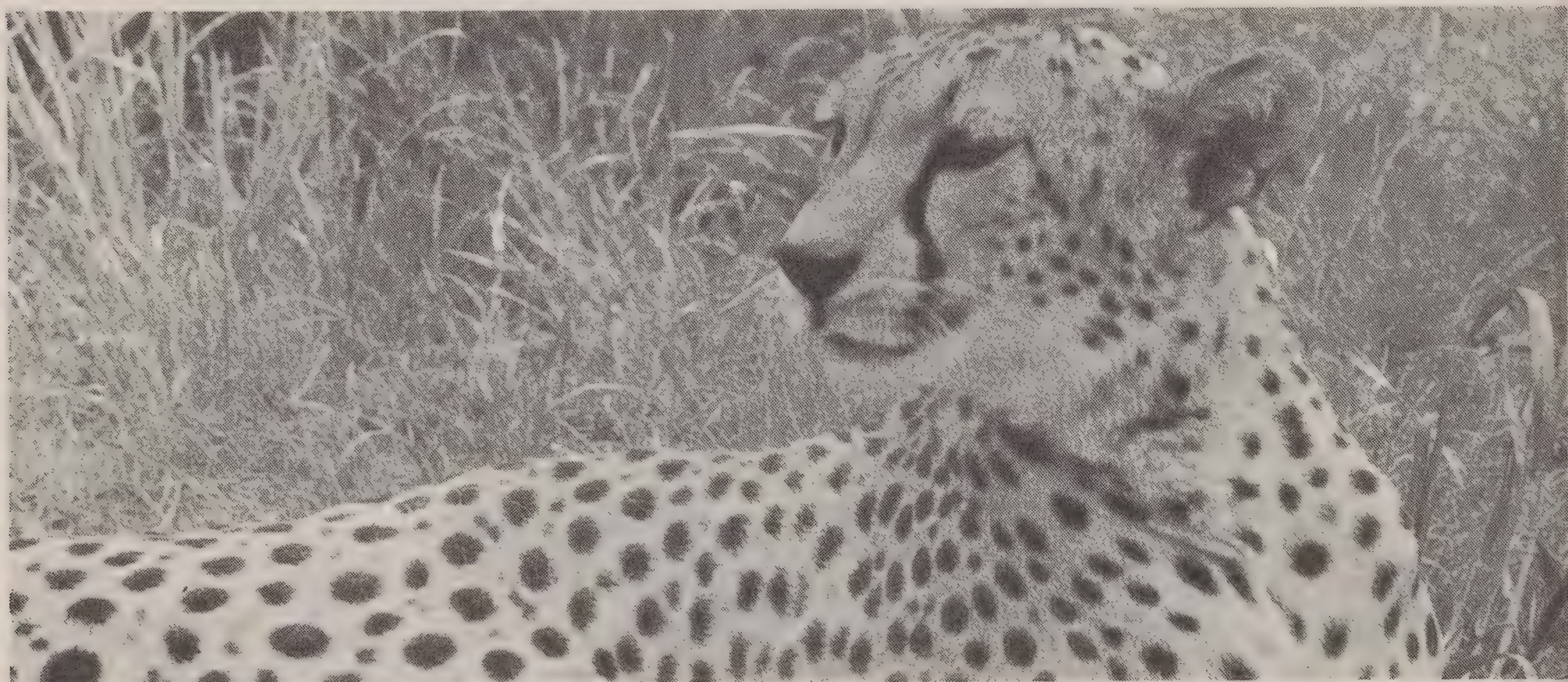
A keeper who has worked with the National Zoo's Komodo dragons for years considers this largest of the world's lizards the most intelligent reptile he has worked with; he ranks the king cobra (*Ophiophagus hannah*) second. He demonstrated the lizard's intelligence by teaching the female to respond to a distinctive whistle he used to call her when she was living alone in the summer enclosure. At first she showed no sign of recognition; then she learned to jerk her head up, if lying down, and try to ascertain the direction from which the sound was coming. At times she would be asleep in the house and would respond to the whistle by running over to the fence to locate her keeper. It was the sound rather than the keeper himself that elicited her response; she reacted in the same way to a tape recording of the keeper's whistle. Most surprisingly of all, she remembers the whistle

when she is outdoors summer after summer; but she shows no recognition of it in the dragons' winter quarters inside the Reptile House, where it evidently does not sound the same to her. The male, too, has learned to respond to the same call; he began to do so after having been at the Zoo only two months.

The Zoo's male weighed 238 pounds on his arrival in 1970; at that time the female, who had lost weight after recently laying a number of infertile eggs, weighed only 52 pounds. Because of this size difference, they were watched carefully when first put together, and the female was kept locked in the house at night. For a while the female seemed to pay no attention to the male and did not even go near him. Finally, however, she approached him, investigated most of his body with her tongue, and nuzzled his underside. The male responded by expanding his

throat, then rapidly expelling the air to produce a hissing sound. Since then, the pair have lived together with mutual tolerance, the female often resting one of her forefeet or her head on the male's back.

Last summer, the male was observed attempting to mate with the female for the first time; she seemed afraid and ran away from him to the other side of the cage. Later the same day, she returned to the male and lay down next to him, but he showed no interest in her. About a week later, he was observed pursuing her around the enclosure, but she managed to escape whenever he got too close. No further mating activity was observed all summer; but it is hoped that this year the female will prove less skittish, and 1972 will see a successful breeding of these unique reptiles at the National Zoo.



One of the National Zoo's pair of cheetahs
(number 22f on map).

The Cheetah

by
Laura Kent

The best known and, to many people, the most impressive fact about the cheetah (*Acinonyx jubatus*) is its remarkable speed. The most reliable estimates place the maximum at 60 miles per hour, on open ground and for the relatively short distance of about 100 yards, although a speed of 70 miles per hour has been reported from Florida. It was in Florida, too, that an attempt was made to introduce cheetah racing, patterned along the lines of greyhound racing. The failure of that

attempt provides certain clues to the character of the cheetah. If the mechanical rabbit was set too slow, the cheetahs quickly overtook it and ripped it to shreds. If it was set too fast, they declined to chase it at all. They showed no interest in racing against one another; and, when raced against the dogs, they stood for a few seconds watching them, then burst into a sprint (they can accelerate to top speed in two or three strides), overtook their opponents, and leaped easily over their backs — leaving behind, one imagines, some very startled greyhounds.

What is less widely recognized about the record-breaking ability of this fastest of all mammals — unless one has been fortunate enough to view a slow-motion film sequence of a cheetah pursuing its prey at top speed

— is the extraordinary efficiency and beauty of the sprint. All the physical features that combine to make the cheetah in repose or walking seem somewhat rangy and ungainly are suddenly seen in relation to their function. The small and rather low-slung head, the long, thin legs, the flexible and undulating spine, all work together to reveal the cheetah as a highly specialized machine shaped for speed.

Often referred to as the most doglike of the cats, the cheetah occupies its own generic niche in the feline family, being classified neither as *Panthera* (which comprises the lion, tiger, leopard, and jaguar) nor as *Felis* (which is made up of the puma and a vast variety of smaller cats such as the serval, the jaguarundi, and the housecat itself). Its unique attributes — particularly certain peculiarities in the formation of the skull — have led taxonomists to place it in its own genus, *Acinonyx*, of which *jubatus* is the single species. During the twenties, a few specimens found in North Central Rhodesia were tentatively tagged as another species, *rex*, because instead of spots, they had stripes running lengthwise down the back and diagonally on the flanks. Further consideration, however, led most zoologists to conclude that these were merely color variations of *jubatus*. At one time, cheetahs lived free in India, Egypt, Libya, Morocco, and Rio do Oro, but the Asian and North African populations have been virtually extinct since 1935, except in Iran; the remaining cheetahs south of the Sahara are confined more and more to limited areas in East, Central, and South Africa.

At a first casual glance, the cheetah might be taken for a thin leopard — indeed, one of its popular names is “hunting leopard” — since it has the same basic ground color of a tawny gold, with sometimes a reddish and sometimes a greyish cast, and black spots. The spots are, however, more evenly spaced, more alike in size, and more regular in form; and they are solid rather than rosette-patterned like the leopard’s. In addition, the coat is somewhat coarser.

Other differences become apparent on closer inspection. Though about the same in total length as the leopard, the head and body being from 4½ to 5 feet and the tail another 2½ feet, the cheetah stands slightly higher at the

shoulder: about 3 feet compared with the leopard’s 2 feet or slightly more. But the cheetah is considerably lighter, ranging in weight from 100 to 140 pounds, whereas the leopard weighs from 120 to 180 pounds. This difference is accounted for by the cheetah’s being lighter-boned and less heavily muscled than the leopard. Its most distinctive facial characteristic — and one that gives it an expression which has long intrigued human beings and led them to describe the cheetah as aloof, dignified, and mournful — is the form taken by the “tear marks.” These dark lines are present in all cats, but in the cheetah they are especially spectacular, running from the inner corner of each eye, curving out around the muzzle, and ending at the outer corners of the mouth.

Still other distinctive characteristics may not be so obvious. The head is small, the muzzle is short, the eyes are set high in the skull to allow better vision over tall grass. Broad nostrils and a highly expandable chest and large lungs permit the rapid oxygen intake needed for quick energy in the sprint. The cheetah’s feet also set it apart from other cats; the toes are long, for extra leverage, and the pads are thick and tough, with rounded edges that provide a gripping surface for split-second changes in direction while pursuing prey. The rather thick tail serves much the same function, acting as a kind of rudder. Contrary to popular belief, the cheetah’s claws are not totally non-retractile, as a dog’s are. But they have no protective sheath and so become blunted with use. Though the cheetah cub is an excellent climber — reportedly able to cling upside down to the top of a wire cage — it loses its climbing ability as the claws are worn down, rendering it more vulnerable than are other members of the cat family.

All these aspects of its structure make the cheetah a living object lesson of the principles of natural selection — and of the dangers of overspecialization as well. For the cheetah’s physical characteristics suit it admirably to its mode of living but at the same time impose limitations upon its adaptability to disruption of its environment by man and therefore its survival as a species.

Cheetahs hunt by day, usually at dawn and at dusk, and by sight rather than smell. They

prefer the open grasslands but often hunt in denser savannas. The favored terrain seems to be one with grass and short acacia trees, with dirt mounds and bluffs suitable for an overview of the area, and with a plentiful supply of water.

Unlike lions — which usually hunt in groups, some individuals moving upwind of the intended prey and stampeding them into the waiting jaws and claws of other individuals — and unlike leopards, which use a solitary ambush technique, the cheetah is a courser. Its hunting method may consist of a stalk, until it is within a few hundred yards of its prey, then an attack, a burst of speed in which it attempts to overtake and kill the prey. The particular hunting method used depends upon the type of habitat. In heavy grasslands, cheetahs usually stalk the victim, belly to ground; their coloration provides excellent camouflage, and often the cheetah can be detected only as a pair of rounded ears or the white tip of a tail above the grass. In more open country, the cheetah may not attempt a preliminary stalk at all but use, instead, what has been called a “diagonal open approach,” in which it moves in profile to the herd; apparently the prey animal does not perceive the cheetah in profile as a threat and is not aware of danger until the cheetah actually turns and charges.

If it cannot overtake the intended prey within a few hundred yards, the cheetah usually gives up the chase but rapidly recovers its energy and begins the hunt again. If it does overtake the prey, it moves alongside and tries to knock the animal off balance with out-thrust forelegs. The actual method of the kill, once the victim has been downed, is disputed; most authorities say that the cheetah severs the jugular or the windpipe.

Observations have been made of the proportion of kills to hunts under various conditions in Nairobi National Park. Overall, 157 hunts, resulting in 30 kills, were recorded. In acacia-grasslands, where over half the hunts were carried out, 13 out of 83 (16 percent) were successful. In open grasslands, the tally was 23 percent. In heavy bush, four in twelve hunts ended in kills; in marshy country, only one out of a total of ten hunts was successful. Moreover, when the intended prey showed signs of being aware that an attack was

about to take place, the cheetah was successful only six percent of the time; then the prey remained unaware, the cheetah had a fifty-fifty chance of bring it down. The size of the herd is also related to hunting success; smaller herds, with less efficient warning systems, are more vulnerable than are large herds.

The species that the cheetah preys upon number around 25, all the way from birds and small mammals such as hares or young warthogs up to wildebeest and zebras. In Nairobi National Park, the preference was for impala, Grant's gazelle, and waterbuck. Thomson's gazelle and kongoni were frequently hunted but rarely killed.

Several factors probably determine which species are selected for prey, the most important being their availability in a given area. The cheetah may also have certain taste preferences as a result of its early experiences. The cheetah cub is taught to hunt by its mother; though she may kill a particular prey mainly because of its abundance, the cubs then tend to seek out that species as a matter of choice. Evidence indicates that cheetahs are selective in that they are able to single out the weak, the immature, and the females over the healthy, adult males in a herd.

What is the relative efficiency of the cheetah's various hunting techniques? The stalk-attack method is more likely to result in a kill, since the intended prey is less likely to be aware of an impending attack than if the straight pursuit is used. On the other hand, the stalk-attack is more time-consuming. The solitary hunter — whether a female killing for her cubs or a lone adult male — is probably at a disadvantage over cheetahs that hunt in groups, though the size of the group seems to bear little relation to its efficiency as a hunting unit, the most successful of the four groups in the observations made in Nairobi National Park being composed of two adult males.

Predators have not only distinctive hunting patterns but also distinctive feeding patterns — so much so that an experienced observer can often identify the killer from the remains of its victims. In this matter, the cheetah has the dubious distinction of being one of the sloppiest of feeders, probably because it does not hold the prey in its claws while eating but

simply gouges out chunks with its teeth. In addition, cheetahs eat the prey at the spot where they kill it (probably because they lack the powerful muscles needed to drag it off), and they usually make only one meal off a kill. They will not eat carrion, as lions and leopards will. These habits make the cheetah a rather wasteful eater and increase the necessity of frequent hunting.

In their social life, cheetahs are neither as gregarious as lions (who usually live in prides, based on a loose association of families, numbering from three to four up to twenty or thirty individuals) nor as solitary as leopards (who usually associate only for mating or in groups of a mother and her cubs). In areas where the population is generally sparse, adult male cheetahs are often solitary or move around in pairs. In Nairobi National Park, where the cheetah population is unusually dense (one for every two square miles, as opposed to one for every 50 square miles in other parts of Africa where cheetahs are found), adult males associate in hunting groups which average three members, almost certainly litter mates. One male is dominant — a position that he assumes without having to do battle with his siblings — and he determines the direction to be taken and the time and place of the hunt. He also exhibits more alertness than the others. The hunting groups are highly cohesive; strangers are not admitted, and hunting groups do not mix with each other. At the same time, aggressive attacks between individual cheetahs or between hunting groups are rare. When two groups pass in sight of one another, they go through a threat display, laying back their ears, lowering their heads, and exposing their teeth; but the groups keep their distance. The same is true when two solitary males pass one another; again, they have been observed to do a fair amount of snarling and urinating, but no actual attack results.

Given these facts of cheetah life, can one speak of territorial behavior in the cheetah? How do hunting groups avoid sudden face-to-face encounters that would almost certainly lead to direct aggression? How do groups in a given area space themselves in competing for food? Since cheetahs must roam over fairly large areas (probably about 20 square miles) to be assured of a plentiful supply of prey, how do they go about defending territories

when so much of their time and energy must be spent on the hunt? Evidence suggests that the answer to these questions is that cheetahs have a spacing mechanism that has been labeled a “time-plan” system. They have no rigidly fixed territory which they defend against intruders of their own species but rather a “moving” territory within time boundaries.

Scent marking is the specific device employed to keep other hunting groups out of the area at a given time, thus preventing interference with the hunt and lessening the chance of unexpected encounters at close range. The adult male can urinate directionally; this he does frequently throughout the day, choosing as his marking places such outstanding objects in a landscape as trees, bushes, and dirt mounds, or — in fairly open areas — rare plants among more common ones. A given hunting group has its own favorite marking places (identified by early writers as “scratching posts”), and the group will often follow a roundabout rather than a straight path in order to visit and mark these favorite sites. Another group coming across such a marking place within 24 hours after the first, can easily locate it; for though cheetahs do not use smell in hunting, they spend much time in sniffing for signs of other cheetahs. Once such a spot has been found, the members of the group, moving slowly and deliberately, sniff out other objects in the immediate vicinity until one of them has located a second spot, at which point he kneels down, thus signaling to the other members of the group, each of which then inspects the spot for himself. Having discovered the route taken by the first group, the second moves off in a different direction. The scent markings, though they apparently linger on for several days, lose their power as a warning device after 24 hours. A second group coming across the markings of the first after a longer time period, though they show awareness of the markings, have no hesitation about following in the same direction.

Adult females do not form such hunting groups, though a female hunts with the male for a short time after mating and a mother may sometimes be seen hunting with her grown cubs. Nor do they scent-mark in the same way the males do, but the female does heed the warning signals left by adult males

and does not take the same route. When in heat, however, she leaves a characteristic scent wherever she sits or urinates, and this scent alerts interested males, which then follow her. Unlike the other big cats, cheetahs do not use vocalizations to attract mates.

Cheetahs do make a variety of sounds that can be recognized, to some extent, by the human beings who associate with them. They are not "roarers" like the other big cats — lions, tigers, leopards, and jaguars — since they lack the necessary elastic ligaments between the hyoid bones that connect the larynx and skull. Their most distinctive vocalization is usually described as a "birdlike" or "metallic" chirp. Some authorities regard this sound as a distress signal, but the more common view is that it is simply a means by which cheetahs "converse" with one another. In addition, they snarl and spit practically from birth in response to unfamiliar smells; they give a gurgling squeal or snuffle when tussling with one another over food; and they purr heavily to indicate contentment. Even as day-old cubs, they are capable of a shrill purr.

Unfortunately little is known about the breeding habits of cheetahs in the wild, as is attested by the lack of success that zoos have had in setting up ideal conditions for their reproduction. As was mentioned, the female cheetah gives off a scent when in estrus that attracts the male, or more probably a number of males, who may fight among themselves for her favor. The mating pair spend a brief "honeymoon" period hunting together.

The precise role of the male in raising the family is not known, although Joy Adamson, who raised an orphaned female cheetah to adulthood, says that this female's mate continued to visit her periodically during her pregnancy and after she had given birth. Apparently, however, he did not help out to the extent of providing meat for the cubs, and the female had to do her own hunting. It seems likely, from this and other evidence, that the female does indeed carry the primary responsibility; if so, this would help to explain why the female cheetah needs no scent-warning system to avoid encounters with other groups; as in other carnivore species in which the female takes care of the young by herself, she is probably quite aggressive when with cubs and is thus accorded considerable respect by others.

The female cheetah probably first mates when she leaves the family group at around age 2; Adamson's cheetah was 26 months old when she had her first litter. The gestation period is around three months, and the average litter numbers from two to five. In one instance recorded of a captive birth, it took only 1½ hours from the first signs of labor to the birth of the third and last cub. Each cub was about 10 inches long and weighed close to nine or ten ounces at birth.

Anyone getting his first look at a newborn or very young cheetah might be hard put to identify it, since it is covered with thick, silvery-brown fur that runs down the length of the back, though its flanks and underparts are heavily spotted, and its face has the characteristic cheetah markings. By the time the cub is 7½ weeks old, this mantle has disappeared except around the shoulders. It is represented in the adult by a short neck mane or ruff.

From the beginning, cheetah cubs are active; three born in a private zoo in Rome were moving while still in the fetal sack and began nursing immediately after they were released from it. By the second or third day, the cubs were crawling about; by the ninth or tenth, they could stand somewhat shakily on all fours; by the sixteenth day they could walk. Generally, the eyes begin to open on the tenth or eleventh day, though they are at first covered by a blue film; by the fifteenth day, they are fully open, and by the end of the fourth week, the cubs can focus. With eyes open, the face loses its helpless infant appearance; it has been variously described as being like "the deeply lined, wrinkled face on an old person" and as looking "fierce and comically pugnacious." By the end of the fourth week, the canine teeth break through the gums; and the cubs begin to eat meat during the fourth or fifth week and are fully weaned by the time they are five months old.

In the wild, the mother moves the cubs from den to den frequently, probably to lessen the likelihood of their being found by predators. Adamson's cheetah transferred her litter to new nests over twenty times during the first six weeks of their lives. Though they played freely when the mother was with them, even venturing out a bit on their own, they remained rigidly motionless when she was gone.

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When they were seven and a half weeks old, the one male in the litter, though smaller than his sisters, established himself as dominant, acting in an almost protective manner toward his mother. By ten weeks, the cubs were starting to climb trees. By the time it is ten months old, the cheetah cub is almost as large as the mother and has turned from a rather stumpy-legged and plump creature into a leggy and awkward adolescent. The family group begins to break up when the cubs have demonstrated their ability to live independently by making kills on their own and going off for ever increasing periods by themselves. One of the cubs born to Adamson's cheetah made her first kill at 14 months and, 2½ months later was leaving the group for several days at a time, an absence that the mother seemed to accept without apprehension. At this proof of the cubs' approaching maturity, the mother herself went off and became pregnant. She returned periodically to her three remaining cubs, gradually widening their territory until it covered close to 60 square miles and staying with the cubs for about ten days while they familiarized themselves with new areas. She left them definitely, to seek out a birthplace for her approaching litter, when they were 17½ months old. The three remaining female cubs stayed together for a while, making no attempt to search for their mother and showing no nervousness at being on their own, and then they too split up. One went off by herself to become a solitary hunter, the other two hunted together until such time as they, presumably, mated and became fully independent. The territories adopted by each did not overlap, and — as far as could be ascertained — the mother had no chance encounters with her now-grown cubs.

The mortality rate among cheetah cubs is high; they suffer heavily from predation by lions (animals that the cheetah shows signs of fearing greatly), hyenas, leopards, and even eagles. Of the 11 cubs that Adamson's cheetah bore in a two year period, three survived to maturity and one of these made it only through the intervention of human beings. Two litters simply vanished, presumably falling victim to predators, and the male cub of the second litter died of feline enteritis, one of the several diseases that may kill off young cheetahs in the wild. Another

observer reports that, in Nairobi National Park, of five litters averaging five cubs each, half died during the first eight months after birth. When a female cheetah loses a litter, she comes into estrus again almost immediately.

In the wild, then, cheetahs live, at best, a precarious existence, under pressure of predation, disease, and a short food supply. Their hunting and feeding habits make it necessary for them to expend much time and energy simply seeking food; their relative scarcity in most areas means that they may have difficulty in finding a mate; their limited gregariousness makes them almost entirely dependent on their own abilities and resources; and the mother's responsibilities as breadwinner restrict her capacity to protect the helpless cubs at all times.

Man has done little to help the situation. Though the cheetah has been tamed for centuries (carvings on Egyptian tombs from 1500 B.C. show leashed and collared cheetahs), it has been exploited chiefly as a hunting animal. Indian maharajahs devastated the numbers of Asian cheetahs to the point of extinction; by the end of the 19th century, they had become so scarce in India that deputies of the rajahs had to go to Africa for fresh specimens.

Today the African cheetah stands in danger of being wiped out entirely. In 1964, Armand Denis, writing for the World Wildlife Fund and the International Union for the Conservation of Nature, placed the cheetah in category D, which comprises the most heavily endangered species. Despite the long association between cheetah and man, almost nothing is known about its breeding habits. Those who used cheetahs for hunting were content to go off and capture new ones when those in their establishment died. More recently, cheetahs have been hunted to satisfy the avarice of the fur trade and the vanity of human beings. Though they are now better protected in Africa's national parks, their dwindling numbers and the continued destruction of their habitat and decimation of their prey species may work their downfall, as is true for so many of Africa's wild predators. ■

